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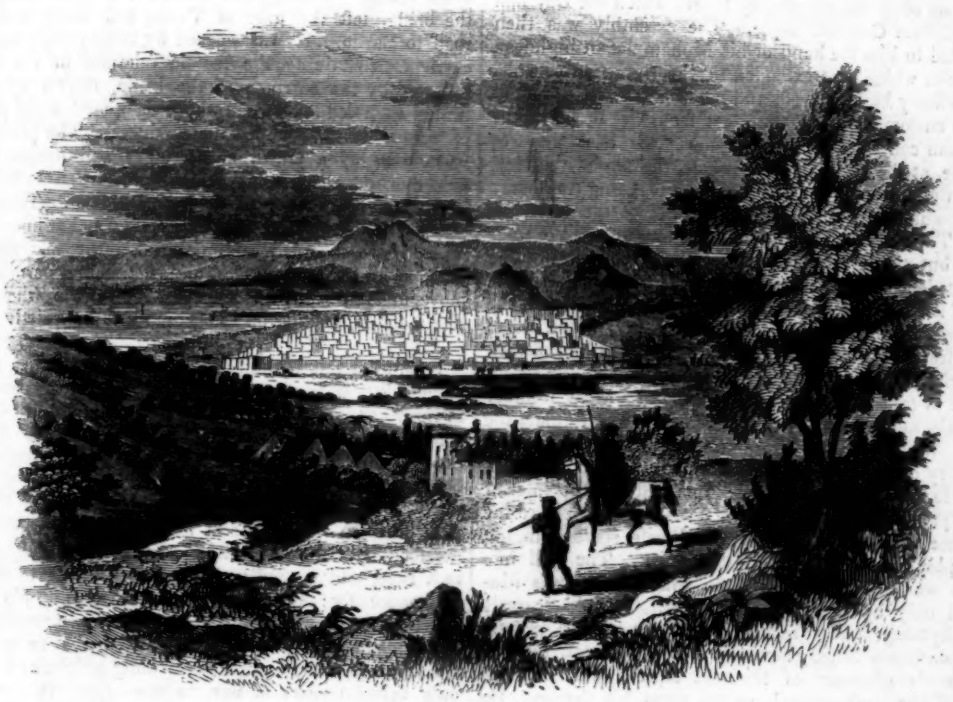
TUNISIAN MANNERS.

PUBLIC PROCESSION.—THE BEY'S INAUGURATION.—THE DIVAN.—NUPTIAL DOINGS.

[From the Rev. J. Ewald's 'Journal.']



[Tunis.]

TUNIS; *October* 15.—Great apprehensions have been entertained here for some months in consequence of the report that the Turks intended to proceed against Tunis in the same manner as against Tripoli, and that the Grand Seignior was fitting out a fleet destined for this place. In confirmation of the rumour, nothing had been heard of the Sachab Ettaba, who had gone to Constantinople some time since, to fetch a caftan for the new Bey. His arrival, however, a few days ago, banished all these fears, particularly as he had concluded his business to the entire satisfaction of the Bey. His quarantine having expired, he this morning made his public entry, and proceeded to his country-house, Sidi Ismael, which is situated between Tunis and Bardo, the residence of the Bey. The chief members of the divan met him on horseback, about half way between this place and Gouletta. Three thousand men also advanced to welcome him and to conduct the ambassador to his own dwelling. The procession was beautifully arranged; in front came the members of the divan, aged venerable-looking men; next appeared the Sachab Ettaba, on a richly caparisoned horse, in the new uniform of a general, blue with gold epaulettes, bearing in his right hand a blue silk bag, containing the firman of the Turkish emperor, and in his left another blue silk bag, in which was a sword, sent to the Bey by the Grand Seignior. Yesterday the solemn recognition of the Bey took place, and, wishing to see it, I went to Bardo, the residence. The throne was set up in the great fore-court of the castle, and towards eight o'clock the Bey appeared, surrounded by the princes, who were followed by his five headsmen, in red uniforms. When the Bey sat down on the throne, the princes ranged themselves on the right, and the headsmen with the nobility on the left. The chief headsman then pronounced a blessing, in a loud voice, upon which the nobles approached and kissed the Bey's hand. All the members of the divan, consisting of three hundred autopashas and four hundred bulkpashas, now made their appearance. The whole government is of Turkish origin, for which reason all the members of the divan must be soldiers and of Turkish descent. Immediately on the birth of a boy whose father is of Turkish blood, he receives a pension of a nasri daily. After he has attained the age of fifteen, he is enrolled as a soldier, and has four nasri per day. After having served for some time he is raised to the dignity of autopasha, and afterwards to that of bulkpasha, which constitutes him a member of the divan. Formerly the standing army was entirely composed of Turks; no Moors were admitted into it, and even now all the fortresses of the country are garrisoned with Turks. But as the army has now been reorganised, and consists of about five thousand men of all nations, the Turkish militia is losing its influence, and will, in all probability, be gradually abolished. The members of the divan were formerly dressed in a very singular manner, but their present costume, which is according to the pattern set by the Grand Seignior, is

very simple; they all appeared without turbans, but wore the red caps, or schaschia. When the divan had entered, all the officers and subalterns of the two new standing regiments came in, followed by the European consuls. Only the members of the divan had seats. As soon as the various persons were assembled round the throne, the flags and the horse-tails were brought in. The Sachab Ettaba now made his appearance, with the robe of honour which he had brought from Constantinople, consisting of an upper coat or cloak, which the Bey immediately put on. He then decorated him with the sultan's order, which was composed of brilliants, and girded him with the new sword; the firman was read aloud, together with numerous other congratulatory letters which the Bey had received from Constantinople. The assembly was then permitted to kiss the hand of his Mohammedan highness, an honour which was extended to the European consuls. The military band played, and coffee was handed round.

It is customary at all the great festivities to invite the European consuls to court. Some years back this was the case, at the nuptials of a prince, the son of the Bey, who, in addition to his four wives, was going to marry the daughter of the Sasch Mufti, chief of the ecclesiastics. The consuls were invited the day before the wedding, but the English consul, who did not mean to be present, lent me his carriage, and I proceeded with the rest of the consuls to the residence. On arriving at the court we drove through a covered archway, which led to the entrance of the fore-court, where a crowd of armed Mamelukes were stationed. We alighted in the grand square in front of the palace, and found a great number of Arabs and Moors, who had come to congratulate the Bey. We were conducted into the chamber of the chief secretary of state, and soon informed that the Bey was ready to receive us. We were then led into the interior of the palace, to the Bey's great state-chamber, before the entrance of which sat numerous female slaves, singing and playing on musical instruments. The hall into which we were ushered had no window, and was illumined only by a single wax-light. I could scarcely see anything, and groped about like a blind person. This darkness lasted, however, but a moment, and by the feeble glimmer of the wax taper I perceived the Bey in the back-ground, seated upon his throne. He was dressed in blue silk, wore a gold dagger in his girdle, and a large brilliant on his finger, which, in the obscurity of the apartment, showed a magnificent play of colours. The consuls approached his highness and kissed the flat side of his hand, an honour which is granted only to the Christians, and which was also extended to me. The Mohammedans always kiss the hollow of the hand. When we had seated ourselves to the right and left of the Bey, I had leisure to look about me a little. What a surprise! for the first moment I fancied myself translated to a fairy palace. The walls of the saloon were hung with tapestry embroidered in gold, and a multitude of richly-adorned females were ranged along the sides of the room. Daggers, sabres, guns, ornamented with gold and precious stones, were hung all round. Clocks, fine porcelain, and all sorts of rich European furniture were scattered about in strange confusion, and the floor was covered with a most costly carpet. The obscurity of the dimly-lighted saloon, the dazzling glitter of the gold and precious stones, the incessant ticking and striking of the clocks, the presence of the whole court, of the Christian consuls, the Bey with all his family, combined to make altogether a wonderful impression upon me. After a short pause, refreshments were handed round, and while we partook of them, the military band, stationed outside, struck up.

The Bey put several insignificant questions to the consuls, to which they made similar replies. We had passed about half an hour in this enchanted hall, when the Bey arose, which was a signal that the audience was over. We were conducted through the various apartments of the harem, and saw all the costly articles they contained. The bride's chamber was distinguished by its beauty and richness. When we had finished our wanderings, we found the Bey and his court standing in a great hall, where he dismissed us very graciously. The same day, at three o'clock, the bride made her entry into the palace. The road from Tunis to Bardo was lined on both sides with crowds anxious to see the procession. The Arabs had horse-races, and diverted themselves with their national games, even upon the public road. The game consisted chiefly in mounting their horses with the rapidity of an arrow, and loading and firing their long guns while riding. About three o'clock the procession, with the bride, left the gate of Tunis, and slowly took the road to Bardo. It was opened by twenty-eight covered carriages, containing the female relations of the bride, followed by the carriage of the bride, drawn by eight mules, each led by two of the body-guard, large parties of whom also surrounded the carriages. The procession was closed by a crowd of carriages and horses. The next morning the consuls' ladies were invited to visit the bride, a favour never granted to the men. They were sumptuously entertained, and conducted to her apartment, where she was seated on an elevated throne. She was laden with precious stones, and, not being permitted to move, or even to lift up her eyes, she sat the whole day like a statue, looking on the ground, to be quietly gazed at.

Soon after this wedding, I was present at that of the Sachab Ettaba, to whom the Bey gave one of his daughters in marriage, on which occasion a very singular circumstance occurred. When the Sachab Ettaba for the first time entered a room with his bride, she trod upon his toe, which is a sign of content, and implies that the husband is to be the slave of the wife, she being a princess both by birth and authority. It was so understood by the proud minister, who left the apartment in a rage, and instantly repaired to the Bey to demand vengeance for the insult. The Bey and his whole court were thrown into the greatest consternation, and he immediately summoned all his wives to ascertain which of them had urged the young princess, who was only thirteen years of age, to this step. It turned out to be her sister, who was in like manner married to a person in high rank, who had raised himself from a state of slavery. The women were punished, and the offended minister left Tunis the same day, and repaired to the interior to extort money from the Bey's subjects.

THE MANUFACTURE OF SHIPS' BISCUITS.

The application of machinery to manufactures is valuable in proportion to the number of articles of *one kind* required to be produced; since if there be no likelihood of a large demand arising for any one article, it is not often that the expense of fitting up machinery is willingly incurred: but let it be an article for which a demand is at all likely to arise, and nothing is too trifling to be considered unworthy of the application of machinery. It is probable that some of our commonest children's toys would present instances of this; but the articles of production to which the present paper refers, though trifling in individual value, have collectively an importance which renders them worthy of a brief notice.

Ships' biscuits are now made by machinery; and one of the reasons for this has been that the manual preparation of them was too slow and too costly during the last war. A landsman knows very little of the true value of a biscuit: to him it is a trifle—an occasional apology for a meal; and whether he calls it "Abernethy," "butter," "fancy," or "sponge" biscuit, he deems it nothing but a trifle. With a seaman it is far different: to him biscuit is *bread*—the only bread that he eats for months toge-

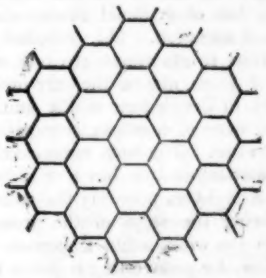
ther. There are many reasons why common loaves of bread could not be used during a long voyage; the principal is, that, containing a fermenting principle, or leaven, they would soon become musty and unfit for food, if made previous to the voyage; while the preparation of them on board ship would be subject to numerous objections, which we need not stop to explain. Biscuits contain no leaven, and being well baked throughout,* they suffer but little change during a long voyage.

The allowance of biscuit to each seaman on board a king's ship is, we believe, about a pound per day (averaging six biscuits to the pound). The supply of a man-of-war for several months is consequently very large; and it often happened during the last war that the difficulty of making biscuit fast enough was so great that at Portsmouth waggon-loads were unpacked in the streets and conveyed on board ships just on the point of leaving the harbour, there not being sufficient time to convey the biscuit from the contractors to the victualling-department in the usual way. Some of the biscuits were baked in the Royal yards, and some contracted for.

We shall now describe the mode of making biscuits by hand; and afterwards speak of the improved method. The bakehouse at Gosport contained nine ovens, and to each was attached a gang of five men—the *furner*, the *mate*, the *driver*, the *breakman*, and the *idleman*. The requisite proportions of flour and water were put into a large trough, and the *driver* with his naked arms mixed the whole up together into the form of a dough—a very laborious operation. The dough was then taken from the trough and put on a wooden platform called the *break*. On this platform worked a roller, called the *break-staff*, five or six inches in diameter, and seven feet long. One end of this was loosely attached by a kind of staple to the wall, and the *breakman*, riding or sitting on the other end, worked the roller to and fro over the dough, by an uncouth jumping or shuffling movement. When the dough had become kneaded by this barbarous method into a thin sheet, it was removed to the moulding board, and cut into slips by means of an enormous knife; these slips were then cut into pieces, each large enough for one biscuit, and then worked into a circular form by the hand. As each biscuit was shaped it was handed to a second workman, who stamped the king's mark, the number of the oven, &c., on the biscuit. The biscuit was then *docked*, that is, pierced with holes by an instrument adapted to the purpose. The finishing part of the process was one in which remarkable dexterity was displayed. A man stood before the open door of the oven, having in his hand the handle of a long shovel called a *peel*, the other end of which was lying flat in the oven. Another man took the biscuits as fast as they were formed and stamped, and jerked or threw them into the oven with such undeviating accuracy that they should always fall on the peel. The man with the peel then arranged the biscuits side by side over the whole floor of the oven. Nothing could exceed (in manual labour alone) the regularity with which all this was done. Seventy biscuits were thrown into the oven, and regularly arranged in *one minute*, the attention of each man being rigorously directed to his own department; for a delay of a single second on the part of any one man would have disturbed the whole gang. The biscuits do not require many minutes' baking; and as the oven is kept open during the time that it is being filled, the biscuits first thrown in would be overbaked were, not some precaution taken to prevent it. The moulder therefore made those which were to be first thrown into the oven larger than the subsequent ones, and diminished the size by a nice gradation.

The mode in which, since about the year 1833, ships' biscuits have been made by machinery is this:—The meal or flour is conveyed into a hollow cylinder four or five feet long and about three feet in diameter, and the water, the quantity of which is regulated by a gauge, admitted to it. A shaft, armed with long knives, works rapidly round in the cylinder, with such astonishing effect that, in the short space of two minutes, five hundredweight of dough is produced, infinitely better made than that mixed by the naked arms of a man The dough is removed from the cylinder and placed under the breaking-rollers. These latter, which perform the office of *kneading*, are two in number, and weigh fifteen hundredweight each. They are rolled to and fro over the surface of the dough by means of machinery, and in five minutes the dough is perfectly kneaded. The sheet of dough, which is about two inches thick, is then cut into pieces half a yard square, which pass under a second set of rollers, by which each piece is extended to the size of six feet by three, and reduced to the proper thickness for biscuits.

This sheet of dough is now to be cut up into biscuits, and no part of the operations is more beautiful than the mode by which this is accomplished. The dough is brought under a stamping or cutting-out press, similar in effect, but not in detail, to that by which circular pieces for coins are cut out of a sheet of metal. A series of sharp knives are so arranged that by one movement they cut, out of a piece of dough a yard square, about sixty *hexagonal* biscuits. The reason for a hexagonal (six-sided) shape is, that not a particle of waste is thereby occasioned, as the sides of the hexagonals accurately fit into those of the adjoining biscuits; whereas circular pieces cut out of a large surface always leave vacant spaces between. That a flat sheet can be divided into hexagonal pieces without any waste of material, may be seen from the annexed cut. Each biscuit is stamped



with the king's mark, the number of the oven, &c., as well as punctured with holes, by the same movement which cuts it out of the piece of dough.

The hexagonal cutters do not sever the biscuits completely asunder; so that a whole sheet of them can be put into the oven at once on a large peel or shovel adapted for the purpose. About ten or twelve minutes are sufficient to bake them: they are then withdrawn, and broken asunder by the hand.

The corn for the biscuits is purchased at the markets, and cleaned, ground, and dressed at the government mills; in quality it is a mixture of fine flour and middlings, the bran and pollard being removed. The ovens for baking are of wrought-iron, with an area of about a hundred and sixty square feet. About 112 lbs. weight of biscuits are put into the oven at once; this is called a *suit*, and is reduced to about 100 lbs. by the baking. From twelve to sixteen *suits* can be baked in each oven every day, even by the hand process; but it is probable that the machine-made biscuits might be baked with much greater rapidity when required. The men engaged are dressed in clean check shirts, and white linen trowsers, apron, and cap; and every endeavour is made to observe the most scrupulous cleanliness.

We may now make a few remarks on the comparative

* Biscuits were originally "twice-baked;" hence the French and German names, "biscuit," and "zwei-back."

merits of the hand and the machine processes. If the meal and the water with which the biscuits are made be not thoroughly mixed up, there will be some parts moister than others. Now it was formerly found that the dough was not well mixed by the arms of the workman; the consequence of which was that the dry parts became burnt up, or else that the moist parts acquired a peculiar kind of hardness which the sailors called "flint:" these defects are now removed by the thorough mixing and kneading which the ingredients receive by the machine. We have said that 500 lbs. of dough is mixed by the machine in two minutes, and kneaded in four or five minutes; we need hardly say how much quicker this is than men's hands could effect it. The biscuits are cut out and stamped sixty at a time, instead of singly, and thrown into the oven a sheet at a time, instead of singly: besides the time thus saved, the biscuits become more equally baked, by the oven being more speedily filled. The nine ovens at Gosport used to employ 45 men to produce about 1500 lbs. of biscuit per hour: 16 men and boys will now produce, by the same number of ovens, 12,000 biscuits per hour.

The comparative expense is thus stated:—Under the old system, wages, and wear and tear of utensils, cost about 1*s.* 6*d.* per cwt. of biscuit: under the new system, the cost is 5*d.* The bakehouses at Deptford, Gosport, and Plymouth could produce seven or eight thousand tons of biscuits annually, at a saving of 12,000*l.* per annum from the cost under the old system. The advantages of machine-made over hand-made biscuits, therefore, are many:—quality, cleanliness, expedition, cheapness, and independence of government contractors.

DRUMMOND AND BUDE LIGHTS.—I.

Among the numerous subjects which have engaged the attention of ingenious men since the beginning of the present century, that of artificial illumination is not the least deserving of attention. *Oil*, supplied with a wick in order to separate it into minute streams, was probably, for thousands of years, almost the only means employed to procure light in the absence of the sun. At a later period, *candles*, made of a substance capable of yielding flame, came into use. The wax, spermaceti, tallow, &c., employed for their fabrication, however different in their nature, gave out light on precisely the same principles; the following being the steps of the process:—1. The heat applied to the wick melts a portion of the upper part of the tallow, &c., converting it into a kind of liquid oil. 2. This liquid ascends between the fibres of the wick in the same manner, and by the operation of the same principle, of capillary attraction, as water ascends through a lump of sugar. 3. The melted tallow, coming in contact with the flame, is converted into vapour, which ascends in the form of a cone; its temperature being sufficiently elevated to allow it to combine with the oxygen of the surrounding air; while the carbon, or charcoal, of the vapour is separated in a minutely divided state, and, being brought to a white heat, renders the flame much more luminous. The subject of combustion, or the combined production of light and heat, is beset with many difficulties, into which we purposely avoid entering here, and have contented ourselves with enumerating the more obvious steps in the conversion of solid tallow into luminous flame. Where oil lamps are used, all these steps, except of course the melting, occur; and they follow in the same order.

Such were the means employed for the production of light until the beginning of the present century, when a most important application of chemical knowledge was made. A piece of coal contains, among other elements, those which are met with in a tallow candle, although in different proportions, and combined in a different manner. We all know from experience, how often, in winter, a cheerful fire makes us forget that our candles are not yet lighted; and the light conduces quite as much as the heat to the satisfaction we feel: the flame thus produced being fully equal to that from a candle. These facts suggested the happy idea of decomposing coal into its component parts, of conveying the gases thus produced, after purification, from place to place, and of kindling them without the aid of any wick—constituting the modern gas-light. The history of this invention and the mode of proceeding are detailed in the 'Penny Magazine,' vol. iii., pp. 373, 427, &c.

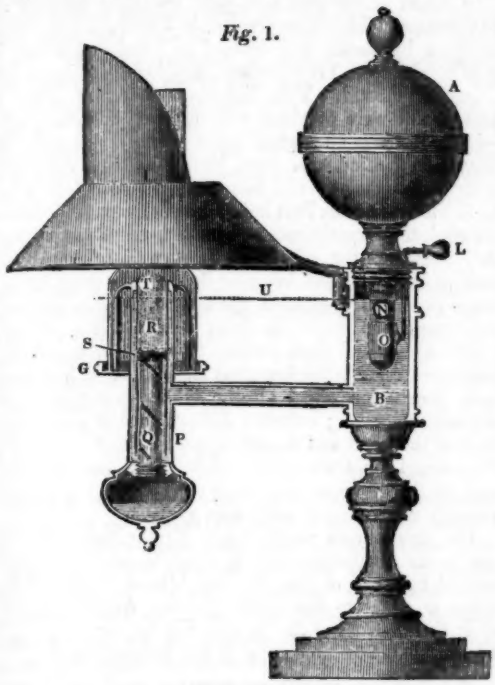
After the adoption of gas-lights in the public streets, the circumstance which seems to have contributed most to further inquiries on the subject was the necessity for an intense light in lighthouses. The principal object of those buildings, as is well known, is to point out to mariners the exact locality of some spots dangerous to navigation; and in order that this may be effected by night as well as by day, a strong light is indispensable. The old custom was to kindle large coal fires in the upper part of the lighthouse, and this plan was adopted at the Lizard Point as late as the year 1812. But this rude and wasteful system had been long before superseded at most lighthouses. The Eddystone, up to the year 1811, was lighted by twenty-four wax-candles; while at some other places an enormous lamp with a wick twelve inches broad was employed. To aid the illuminating power of these candles and lamps, polished reflectors, consisting of a number of facets, or flat surfaces, were placed behind them, so that the rays of light which issued in that direction should be reflected back, and directed seaward. But all these plans were laid aside some years ago for another in every way superior, namely, *Argand lamps* and *parabolic reflectors*—respecting each of which we shall say a few words.

The flame yielded by a common lamp or candle is superficial only; its centre being occupied by vapour not yet ignited. As a proof of this, we have seen a little cup of gunpowder held in the middle of the flame of a candle without being ignited. The reason of this is, that, in consequence of the form of the wick, no atmospheric air can reach the centre of the flame, and that therefore the combustion of the inflammable vapour cannot take place at that part. Now the Argand lamp (so named from its inventor) was a great improvement in this respect; for its wick being *hollow*, the lamp admitted of being so constructed as that a current of air could always pass up through the middle of the wick: and as the rising vapour was ignited both within and without, a more brilliant light was produced, and the quantity of smoke (which is actual waste of combustible matter) was diminished. This was the lamp in use in most of our London shops twenty or thirty years ago; as will be recognised from the annexed cut (*Fig.* 1): the reservoir of oil is above the level of the wick, and the latter has a hollow channel in the middle of the wick.

The *parabolic reflector* consists of two plates of silver and copper united by intense pressure, and then hammered out into that curved form called a paraboloid, of which the small end of an egg may afford a tolerable idea. The silver side being concave, and the light placed at or near the focus, a few inches in front of the centre of the concave surface, all the rays of light which fall on the paraboloid are reflected back, either in parallel rays, or diverging like a cone, according to the position of the lamp.

Such has been the principle adopted in nearly all our lighthouses. A parabolic reflector, from twenty to thirty inches in diameter, has a powerful Argand lamp in front of it, the illumination from which it so much augments, that the light at Beachy Head has been known to be visible at a distance of forty miles. As the reflected light does not diverge very widely, it is necessary to have several reflectors, with a lamp to each, in order to render it available for a wide circuit of sea. What is called a *revolving* light is

Fig. 1.



The reservoir A terminates in a neck, which screws into the upper part of the oil-cistern B; when it is unscrewed and inverted, the oil is poured into the reservoir at the hole N; by moving the handle L, the short tube O is made to cover this hole and prevent the oil from running out, and the reservoir is then screwed into its place, and the handle depressed so as to uncover the hole and to allow the passage of the oil into the cistern B. Within the perpendicular tube P there is placed a smaller tube Q, and both are closed at bottom and open at the top; the space between these contains oil and the wick R, stretched over the short tube S, rising a little above the tubes at T. The outer surface of the tube Q has a spiral groove formed round it, and a tooth in the ring or gallery G entering this groove, when it is turned round, causes the tube and wick attached to it to ascend or descend, so as to regulate the flame. On account of the nature of the reservoir which contains the oil, a constant supply will be kept up at the level marked by the dotted line U, both in the cistern B and in the wick-tubes P and Q.

a contrivance by which the frame-work containing the lamps and reflectors revolves on a central axis once in a minute or more. The object of this is to prevent the light from the lighthouse being mistaken for the fire produced by any kiln, &c. on shore—a mistake which has sometimes led to the loss of shipping. Once or twice in every revolution the lamps of the revolving light are invisible at sea, and the identity of the lighthouse is thus recognised.

In the year 1824, the House of Commons determined on a new survey of Ireland, in which Lieutenant Drummond was to be engaged. Operations of this kind are conducted by parcelling out the country into very large triangles, the three angles or corners of which are frequently seventy or eighty miles distant from each other; and some means have to be adopted for making those stations visible at these great distances. Sometimes the light of the sun is reflected from a surface of polished tin; sometimes Bengal lights are fired at night; and at other times, a powerful Argand lamp is placed in front of a parabolic reflector, or behind a convex lens. Still something more powerful was required, and Lieutenant Drummond suggested the happy expedient of employing what is called the *Lime* light—a suggestion which had, we believe, also been made by Professor Hare and Mr. Gurney. As this lime light, or *Drummond* light, is one of considerable importance, we shall here explain the nature of it.

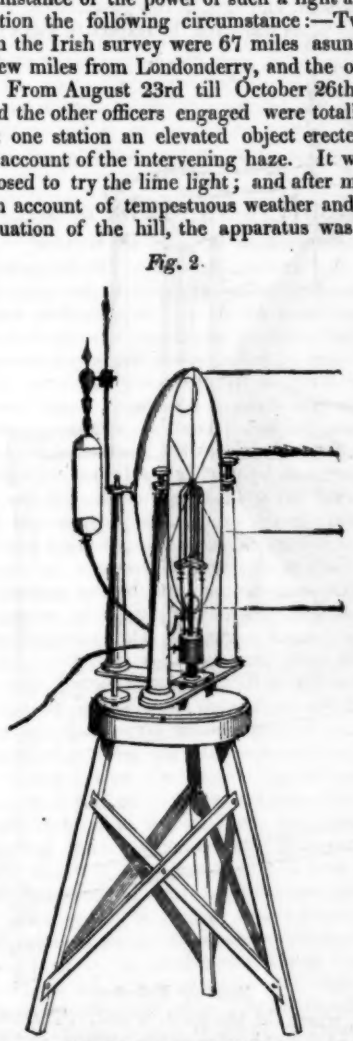
When some of the earths, such as lime, magnesia, &c., are exposed to intense heat, they become brilliantly luminous, to an extent that can scarcely be conceived by those who have not actually witnessed the experiment. Now, it has been long known that if a stream of oxygen gas be thrown in a jet on a flame produced from spirit of wine or alcohol, a very intense heat is produced. Lieut. Drummond accordingly selected different substances, such as lime, zirconia, magnesia, oxide of zinc, &c., and placed small pieces of them so that they might be acted upon by the flame of spirit, aided by a jet of oxygen gas. It was thus found that a little ball of lime, less than half an inch in diameter, afforded a light equal to that of thirty-seven Argand lamps: the other substances were less brilliant than lime.

These experiments were so satisfactory that an apparatus was speedily fitted up. A parabolic reflector was placed behind a small arrangement, in which a ball of lime was acted upon by a spirit flame and a jet of oxygen, so as to produce light which, when aided by reflection from the paraboloid, should be visible at a great distance.

In *Fig.* 2, is seen the reflector, with a little reservoir of spirit behind it, a lime-ball in the focus, and several jets passing up nearly close to the ball.

As an instance of the power of such a light as this, we may mention the following circumstance:—Two of the stations in the Irish survey were 67 miles asunder; one being a few miles from Londonderry, and the other near Belfast. From August 23rd till October 26th, Colonel Colby and the other officers engaged were totally unable to see at one station an elevated object erected on the other, on account of the intervening haze. It was therefore proposed to try the lime light; and after much difficulty, on account of tempestuous weather and the exposed situation of the hill, the apparatus was brought

Fig. 2.



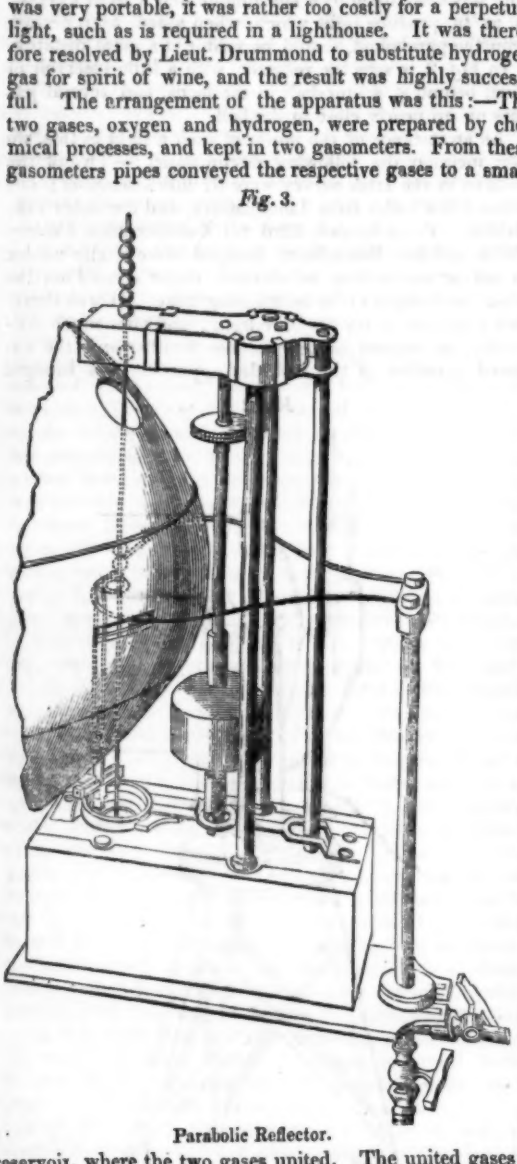
Lieut. Drummond's Light.

into action; and the light produced was instantly seen by the officers at the Belfast station. It is not a little calculated to excite surprise that a piece of lime not

larger than a boy's marble should, when exposed to the action of a flame which in itself is scarcely luminous enough to read by, yield a light capable of being seen 67 miles off; a distance almost equal to that from London to Portsmouth!

In 1826, Lieut. Drummond communicated the result above noticed to the Royal Society, and at the same time suggested that the same light might possibly be available for lighthouses. Shortly after this, a proposal was made by the Brethren of the Trinity House (in whom the management of most British lighthouses is vested) that a series of experiments should be made on the availability of the lime light for such purposes. Such experiments were accordingly made; and they are described in the 'Philosophical Transactions' for 1830. The intense heat before applied to the lime was, as we have said, obtained by directing a stream of oxygen gas through a flame of spirit of wine. But although the necessary apparatus was very portable, it was rather too costly for a perpetual light, such as is required in a lighthouse. It was therefore resolved by Lieut. Drummond to substitute hydrogen gas for spirit of wine, and the result was highly successful. The arrangement of the apparatus was this:—The two gases, oxygen and hydrogen, were prepared by chemical processes, and kept in two gasometers. From these gasometers pipes conveyed the respective gases to a small

Fig. 3.



Parabolic Reflector.

reservoir, where the two gases united. The united gases then passed through wire-gauze screens, and through a very fine tube in two branches, and issued directly upon a ball of lime placed between the ends of the tubes. The greater part of the apparatus was placed behind a parabolic reflector, but the lime-ball and the fine tube were in front of it, and in the focus of the curve.

In order to compare the light produced by such an arrangement with others previously known, a temporary revolving lighthouse was erected on a hill at Purfleet, so as to be visible at Trinity wharf, Blackwall, ten miles and a quarter distant. This lighthouse had four sides or faces, which were provided with lights of different kinds:—in the 1st was an Argand lamp before a parabolic reflector; in the 2nd were seven lamps and seven reflectors; in the 3rd was a powerful lamp with a convex lens before it; in the 4th was the lime light. Lieut. Drummond superintended the experiments at Purfleet, and Captain Basil Hall observed the effects at Blackwall. The Argand lamp produced a small but good light:—the seven Argand lamps produced a light of the same character, but obviously more brilliant:—the lamp behind a lens produced a light whiter and more intense than the seven reflected lamps:—the last of the four, that is, the lime or Drummond light, greatly surpassed all the others in vividness and brilliant whiteness; indeed a distinct shadow was thrown by it of the hand and fingers against a brick wall. The Drummond light was then exhibited in company with each of the others in succession; when its comparative intensity was rendered still more obvious.

The experiments which Lieut. Drummond made, led him to the conclusion that the absolute quantity of light emitted by a ball of lime three-eighths of an inch in diameter, is equal to that from thirteen Argand burners; while the *intensity* of the light at any one given spot is in the lime-ball 264 times that of the Argand burner.

[To be continued.]

THE ORKNEY ISLANDS.

The Orkney Islands are a group of islands belonging to Great Britain. They are situated north of the north-eastern extremity of Scotland, between 58° 44′ and 59° 24′ N. lat., and between 2° 22′ and 3° 25′ W. long. They are divided from the mainland of Great Britain by the Pentland Frith, which is 5½ miles wide at its eastern entrance between Duncansby Head and Borough Point in the island of South Ronaldsha. The flux and reflux of the water during the run of the tides through this strait is broken by the Pentland Skerries, which lie a little more than 4 miles to the north-east of Duncansby Head, and 2½ miles south of the island of South Ronaldsha; and farther westward by the islands of Swona and Stroma, the latter of which lies within 1½ mile of the shore of Caithness. A strong current is thus produced running at the rate of from three to nine miles an hour in various parts of the Frith at one and the same time; a circumstance which causes so much sea in gales of wind as to render the strait very dangerous to deep-laden vessels. There are two lighthouses erected on the Great Pentland Skerry, and another on Dunnet Head, on the south side of the western entry to the Frith, with the assistance of which the strait may be navigated with comparative safety in moderate weather.

The group consists of 67 islands and islets, 27 of which are inhabited; the remainder, called *holmes*, are only visited during the summer for the preparation of kelp or as pasture-grounds. The largest of these islands, called Pomona, or Mainland, extends from south-east to north-west, about 18 miles, and divides the group into two portions. The islands between Pomona and the mainland of Great Britain are called the South Isles, and those north of Pomona, the North Isles. Eight of the South Islands and three Skerries and fifteen of the North Isles are permanently inhabited. They contained in 1831 a population of 28,847, viz.:—

South Isles.	Inh
Swona and Pentland Skerry .	89
South Ronaldsha . . .	2,265
Burra	357
Flota and Fara . . .	369

	Inh.
South Isles.	
Hoy	1,388
Gremsay	225
Copinshay	7
Pomona, or Mainland	15,787
Hunda	5
North Isles.	
Shapinsha	809
Gairsa	69
Weir	93
Egilsha	228
Rousa	921
Enhallow	20
Eda and Fara	756
Stronsa, Papa Stronsa, and Lingholm	1,071
Sanda	1,839
North Ronaldsha	522
Papa Westra	330
Westra	1,702
	28,847

Some of the islands have rocky shores presenting abrupt precipices towards the west, and rise in low rounded hills covered with heath, and with a considerable depth of peat-mould. Others are low and flat, with sandy shores. There are no trees on any of the islands, with the exception of a few of small size in the neighbourhood of the town of Kirkwall, although at some remote period they would appear to have been covered with wood, from the numerous remains found imbedded in the peat mosses.

The geological character of these islands is very simple; the whole group, with the exception of a small granitic district near Stromness, consisting of rocks belonging to the old red-sandstone formation. The prevailing rock is a species of sandstone flag, much charged with argillaceous matter. It occurs in distinct strata, usually slightly inclined, forming hills of small elevation inland, which however often present very magnificent cliffs round the coasts. The colour varies from pale greenish to blackish grey. Occasionally it contains bitumen, and it is the repository of remarkable fossil fishes.

Connected with the sandstone flag are beds of common sandstone of a yellowish or tile-red colour. It forms the chief part of the mountains of Hoy, the highest point in Orkney, and also several headlands in Pomona and Eda. Dykes of basalt and greenstone traverse these rocks in Hoy, Pomona, &c., and a bed of basalt was noticed by Dr. Traill in Hoy.

The granite tract appears in the form of a chain of moderate hills, occupying a length of six miles, and a breadth of from one to half a mile, and ends at Stromness. It is everywhere in immediate contact with a coarse conglomerate, consisting of nodules of quartz, and fragments of granite and sandstone, imbedded in an arenaceous base. The granite, conglomerate, and sandstone flag, above noticed, strikingly resemble the corresponding rocks in Caithness and Sutherland. Fossil fishes occur rather plentifully in Pomona, in the lower beds of a quarry of sandstone flag. The fishes from Caithness and Orkney approach one another very nearly, but among the latter are several new species and even genera. Two of the most remarkable are named, by Agassiz, Cheiracanthus and Cheirolepis. (Traill and Agassiz, *Reports of the British Association, for* 1834.)

According to a rough estimate, the surface of the islands is 150,000 acres, of which less than one-third is cultivated and used as pasture; the remainder is a waste or covered with water. The island of Sanda, which is flat and low, is the most fertile, and accordingly is called the granary of the Orkneys. Wart Hill, on the island of Hoy, has an elevation of 1556 feet, and is considered the highest land in the islands; Wideford Hill on Pomona also rises to a considerable elevation. The coasts of Pomona and the South Isles are very irregular in their outline, and contain several secure and spacious harbours.

As the Orkneys lie open to the wide expanse of the Atlantic, and are exposed to the western gales, which are the prevalent winds, the climate is rather wet than cold. Frost rarely continues for several days in succession, and the harbours are open all the year round. The winter is disagreeable on account of the frequent rains, sleet, and storms, and it is usually prolonged far into the spring, which season also is very damp. The summer is generally fine and pleasant, the heat being very moderate and the weather steady. The early part of the autumn is likewise agreeable, but in November the bad weather commences.

The soil of some of the islands is of inferior quality, but that of others is excellent. Agriculture is limited to the raising of oats, and that kind of barley which in Scotland is called bear, or big, and to the cultivation of potatoes, turnips, and a few other vegetables. Owing to the proprietors having turned their attention for many years exclusively to the kelp manufacture, agriculture has been greatly neglected; but of late great improvements have taken place, and the opening of a regular steam communication with Aberdeen and Edinburgh has given a great stimulus to the raising of green crops and rearing of cattle, for which the islands are peculiarly adapted. Owing to the wetness of the climate and the lateness of the summer, wheat is not found to answer, but oats, barley, and big or bear, are exported in considerable quantities. Cattle are numerous, but small: on several of the larger farms the Angus and short-horned breeds have been introduced with success. Horses are abundant, but small. Sea-fowl abound on most of the smaller islands. Many families subsist entirely on the produce of their fishing; cod, herrings, and lobsters abound along the coast, and seals are common. It has been conjectured that the islands derive their name from the seal, *orc*, in the language of the Northmen, signifying a seal. A few years ago the inhabitants derived a great profit from the preparation of kelp. But for the last five or six years the manufacture has been almost extinct, the article having been quite superseded in the soap and glass works by the carbonate of soda made from common salt. During the war the price of kelp has been so high as 20*l.* a ton, and for many years it was never below 12*l.* Latterly it has sold for about 3*l.* or 4*l.* a ton, which hardly pays the labour of making it and sending to market. The little kelp which is still made is used chiefly in the preparation of iodine. Owing to the extinction of the kelp manufacture, a complete change has taken place in these islands. Under the old system the mass of the population were, in all but name, serfs attached to the soil, being bound to labour at kelp-making for the landlord in exchange for a miserable cottage and little patch of land, and living from year to year without hope or prospect of bettering their condition. The failure of the market for kelp in fact emancipated them, as their labour ceasing to be valuable to the landlord, they were left at liberty to employ it in any occupation which they found most advantageous. The consequence has been a great extension of agriculture, and the rise of the herring-fishery, which had been entirely neglected, into a branch of industry of great importance. Upwards of 700 boats, with six men each, and of the average value, with their nets, of 130*l.* or 140*l.*, are now employed in this fishery, and the number is rapidly increasing. In favourable years from 30,000 to 50,000 barrels of herrings are exported, and from 20,000*l.* to 30,000*l.* are divided among the fishermen and their families. The cod-fishery also, which is prosecuted in the months of May and June, before the great shoals of herrings appear on the coast, is

fast rising into importance, and already brings from 5000*l.* to 7000*l.* annually into the country. The lobster-fishery is also carried on, but is of minor importance.

The inhabitants are of Scotch and partly of Norwegian descent. While the islands belonged to Norway and Denmark, many Norwegians settled on them, and their language was exclusively in use. But since the islands have been annexed to Scotland, a great change has taken place, and the Norse language has been long extinct. A few relics of the Udal tenure, the universal tenure of land among the free nations of the north, may still be found; and there are instances of families who occupy small patches of ground which have descended from father to son from time immemorial. In character, manners, and language, the inhabitants of those islands now differ little from the Scotch lowlanders. They are generally intelligent, educated, and moral. The competition between the United Seceders, who constitute about a third part of the population, and the established church, has done much of late years to extend the means of education and diffuse a spirit of religious zeal. There are few parishes which have not at least two schools. The women find some occupation in straw-platting. A number of young men leave the country to enter the merchant navy, and often rise to be masters and mates of vessels, being in general sober, honest, and able to read and write. Formerly a considerable number went to America in the service of the Hudson's Bay Company, but since the junction of the Hudson's Bay Company with the North-West Company, Canadians have been exclusively employed. A few men also go every year with the whale-ships to Davis's Straits, but, owing to the rapid increase of the herring and cod fisheries of late years, the number who leave the islands in search of employment is considerably diminished.

It appears that the Orkneys were early taken possession of by the Normans, and they remained subject to the kings of Norway and Denmark till the year 1468, but had their own kings or earls, who governed them as independent sovereigns. The Orkneys were the general rendezvous of the piratical fleets which so often devastated the coasts of England and France. Rollo, the conqueror of Normandy, and ancestor of William the Conqueror, was an earl of Orkney. In 1468 the islands were pawned to Scotland for 50,000 florins, and the pledge has never been redeemed. From the year 1471 the earls of the island became dependent on Scotland, and from that time were considered like other chieftains of the Scottish clans.

Kirkwall, situated on a bay on the north coast of Pomona, is the capital of the islands. The cathedral of St. Magnus at Kirkwall is one of the most remarkable specimens of middle age architecture in Scotland; it was built by Olave, king of Denmark. It is in good repair and still used as the parish church. Close to the cathedral are the ruins of the bishop's palace, and of the palace of Earl Patrick Stewart, the last feudal earl of Orkney, who was executed for high treason in the reign of James I. The town consists of one long narrow street, but contains several good houses and shops. It has been recently lighted with gas. The population in 1831 was 3721. It has ten schools, and a considerable trade in the produce of the island. In 1835, 78 vessels, of 4238 tons, navigated by 326 seamen, belonged to this port. In 1834 the shipping which left the port amounted to 8248 tons, and 10,304 tons entered. The town has some distilleries.

Stromness, situated towards the south-western extremity of Pomona, has also a good harbour. It contained in 1831 a population of 2521, and it has considerable trade: about 300 vessels annually enter the harbour.

Though there are several other good harbours, they are not used, except by fishing-boats; the best in Orkney is Inganes Bay for all classes of vessels. The principal stations for the herring-fishery are St. Margaret's Hope in South Ronaldsha and Strenzic in Stronsa. On the island of Hoy there is an excellent and spacious harbour, called Long Hope. The stewartry of Orkney and Shetland, consisting of this group and the Shetland Isles, sends one member to parliament, and the town of Kirkwall, which is a royal borough, returns a member together with Wick, Dingwall, Tain, Cromarty, and Dornoch.

Improvement of Corn and Grain.—Might not the cultivation of the various kinds of grain purposely for seed be more generally practised, and form a distinct branch of agriculture? And would not this be well adapted to small occupiers, and cottagers who may have had allotments of land given or let to them to enable them to live by their own labour and industry without parochial relief? Thus the good qualities of any grain (chevalier barley, &c. &c.) might be perpetuated, new varieties might be produced, and the defects corrected by cultivation, as is the case with horticultural plants.—*Penny Cyclopædia.*

Primitive Corn-Mill of Upper California.—These mills consist of an upright axle, to the lower end of which is fixed a horizontal water-wheel placed under the building, and to the upper end the mill-stone; and as there is no intermediate machinery to increase the velocity, it is evident that the mill-stone can make only the same number of revolutions as the water-wheel. This makes it necessary that the wheel should be of very small diameter, otherwise no power of water thrown upon it could make it go at a rate sufficient to give the mill-stone the requisite velocity. A set of what is called cucharas (spoons) are stuck into the periphery of the wheel, which serve in place of float-boards. They are made of pieces of timber in something of the shape of spoons, the handles being inserted into mortices on the edge of the wheel, and the bowls of the spoons made to receive the water, which spouts on them laterally, and forces round the small wheel with nearly the whole velocity of the water which impinges upon it. This mill is erected at a very small expense.—*Forbes's California.*

The Past and the Future to the Freeman and the Slave.—Freemen have a love for the past and an anticipation of the future. Brought up by the tender care of their own parents, they are immediately connected with the generation before them; rearing up their own children with equal care, they are connected no less with the generation that is to follow them. And as every generation of freemen is so linked with the one before and after it;—and as they have works of their hands and much more of their minds, which live through many generations, so freemen are, as becomes them, "Beings of large discourse, looking before and after." What is ancient is not so much distant from them as consecrated to their minds by having been known and loved by so many of their fathers in so many ages;—what is remote in futurity is that high blessing, to which, if they forfeit not a freeman's privileges, their children, helped by their care and institutions, may one day be enabled to attain. But how is it with the slave? Alas! in the stern but true language of law, he is "nullius filius," the son of nobody; he has no parent and can have no children. What is the past to him, or what the future, so far as earth is concerned, more than to the beasts? Ancient buildings, ancient birth, ancient usages, ancient laws, are to him but words without a meaning. All behind him is a blank, and so is all before him. And thus when we hear men talk with indifference or with hatred of all our best institutions,—when we find them perfectly ignorant and careless of history,—and as incapable of carrying forward their view beyond the immediate present,—we see the certain marks of slaves,—we hear a language which, in all but slaves, is insanity.

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